PORTABLE PRINTER WITH SPINDLE MEMBERS FOR ROTATIONALLY MOUNTING MEDIA ROLLS OF DIFFERENT CORE DIAMETERS

Description

Field of the Invention

The present invention relates to portable printers which print on media from a roll, and relates particularly to rotationally mounting of media rolls of different core sizes in a portable printer between a pair of reversible spindle members, where each spindle member has two sides each with features for engaging roll cores of different diameters.

Background of the Invention

Conventional portable printers use a roll of wound media, such as paper or label stock, which is loaded into the printer such that the media from the roll will properly feed and align with a thermal print head for printing. These rolls have tubular cores and portable printers typically have a pair of holder members each with an extending cylindrical shaped surface for engaging into a roll core, thereby limiting mounting of such rolls with cores of a inner diameter which can frictionally engage the outer diameter of the cylindrical shaped surface. Often such holder members are part of a roll positioning mechanism with respect to printing elements of the printer. One example of such a portable printer is shown in U.S. Patent No. 6,609,844, which has a rack and pinion gear centering mechanism having two rotational spindle members for mounting a roll.

Often rolls are crushed during transportation or storage and will lack a circular cross-sectional shape for proper rotational mounting when loaded in the portable printer, resulting in misaligned rolls which can negatively effects printer performance. This is due to such crushed rolls having a non-circular (oval or eye shape) cross-sectional shaped core, rather than the needed circular cross-sectional shape for mounting on holders or spindle members. Although a user can attempt to recrush the roll in another dimension to re-circularize the roll, the roll is prone to damage and may still not properly rotationally mount in the printer. Thus, holders or spindle members for mounting rolls are desirable which can be used for different diameter rolls and can automatically reshape (or re-circularize) the ends of core crushed rolls.

Different mechanisms have been developed for supporting a roll of media between two members via insertion into the ends of a roll's tubular core. U.S. Patent No. 5,813,343 describes a roll mounting mechanism with two holders each having a cylindrical head with axially spaced concentric steps to accommodate the inner diameters of different dimension tubular cores, such holders are spring urged towards each other. The front of each concentric step extends to a truncated conical form. U.S. Patent No. 6,536,696 describes a point of sale printer having pair of spherical bearing members each extending into the ends of a central core of a roll. U.S. Patent No. 4,821,974 describes a large document printer having two spindles shafts each with a conical surface and a hub assembly having compression springs for urging the each shaft's conical surface into the ends of a media roll core. None of these patents provide spindle members for rotationally mounting a roll which are reversibly mountable in the printer to accommodate different diameter core rolls and have surfaces capable of automatically re-circularizing the ends of a crushed roll core when such holder or spindle members are urged together into the roll core.

Summary of the Invention

It is an object of the present invention to provide a portable printer for rotationally mounting media rolls of different core sizes between a pair of spindle members which are reversibly mountable in the printer to accommodate different diameter core rolls in the printer.

It is another object of the present invention to provide rotationally mounting of media rolls between a pair of spindle members each having a surface capable of automatically re-circularizing the ends of a crushed roll core when the spindle members are urged together.

Briefly described, a portable printer is provided having a housing with a compartment for a roll of media having a core, a roll positioning mechanism, and two spindle members coupled to the roll positioning mechanism to face each other in the compartment. Each of the spindle members has two sides with different diameter conical surfaces and is reversibly mountable to the roll positioning mechanism to select the side of each of the spindle members having the conical surfaces of a diameter for engaging the diameter of the core of the roll mountable between the spindle members.

The spindle members can be detached, reversed, and reattached in the printer, thereby enabling presentation of two different diameter conical surfaces for engaging two different diameter roll cores in the printer. The conical surfaces can also reshape the ends of a crushed

roll core from a oval cross-sectional to a substantially circularly cross-sectional shape when the spindle members are urged towards each other by the roll positioning mechanism (with or without manual assistance) into the ends of the roll core, thereby providing for proper rotational mounting of such roll in the printer. Thus, the present invention can compensate for rolls with oval cores if loaded in the portable printer.

In a preferred embodiment, the portable printer has a housing with a compartment for a roll of media, a centering mechanism having two edge guide members movable in opposite directions with respect to a position between the edge guide members, two spindle members each rotatably mountable upon a different one of the edge guide members for engaging the ends of a tubular core of a roll when loaded in the printer's compartment, thereby aligning media from the roll for printing and advancement in the printer. Each spindle member represents a disk shaped element with two sides, each side having a truncated conical surface of a different diameter extending from the disk element, where the diameter of the conical surface decreases away from the disk element, and an opening extending through the sides of the disk member centrally disposed with respect to the conical surface of each side to provide a hub for enabling rotational mounting of the spindle member upon a shaft extending from its respective edge guide member. Each of the spindle members are detachable and attachable to its respective edge guide member such that the side of each spindle member facing the roll is selected to have the conical surface of a diameter for engagement into a core of a roll when loaded in the printer's compartment.

The present invention also provides a method for using the spindle members in a printer having the steps of providing two roll supporting members rotationally mountable in the printer, in which each of the members has two sides, each side has features for engaging rolls of different diameter cores than the other side of the member; and rotationally mounting each member in the printer in which the side of each member facing the roll has the features for engaging the interior diameter of the core of the roll.

Brief Description of the Drawings

The foregoing objects, features and advantages of the invention will become more apparent from a reading of the following description in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a portable printer having a pair of spindle members for rotationally mounting a media roll in accordance with the present invention;

FIG. 1A is the same perspective view as FIG. 1 with a roll of media located between the spindle members;

FIG. 2 is an exploded view showing the assembly of the edge guide arms and spindle members of FIGS. 1 and 1A with respect to a media roll;

FIG. 3 is a side view of one of the spindle members of FIGS. 1, 1A, and 2; and

FIG. 4 is an end view of a roll core illustrating a crushed core and uncrushed core upon each of the two different diametered conical surfaces of one of the spindle members.

Detailed Description of the Invention

Referring to FIGS. 1 and 1A, a portable printer 10 is shown having a housing 12 with a roll centering mechanism to enable the media wound upon a roll 14 to be centered in a compartment 15 of the housing with respect to a print head for printing on media from the roll. Media may represent paper, or label stock to provide printing of labels from a paper carrier. The centering mechanism has two spindle members 16 each rotationally mountable on an edge guide arm (member) 18, and a rack and pinion assembly (not shown) located in the printer housing 12 for enabling movement of the spindle members 16 along with their respective edge guide arm 18, in opposite directions with respect to a center position between them. The printer has a thermal print head for printing on media extending from the roll 14, and when a cover 20 of the housing 12 over compartment 15 is closed, such media from the roll is advanced by a motor driven platen 22 across the print head and exits the printer. FIG. 1A shows an example of a roll 14 when loaded in the printer 10 prior to closure of cover 20, which is pivotally mounted about a hinge 21. The housing 12 contains printer electronics for controlling operation of the printer, including the print head and motor driving the platen, as shown for example in U.S. Patent No. 6,609,844, which is herein incorporated by reference. The centering mechanism and its rack and pinion assembly may be as described in this patent, with or without automatic alignment to roll width, for coupling racks for reciprocal movement. The centering mechanism and rack and pinion assembly may have multiple (e.g., three) pinions or gears coupling racks for reciprocal movement, such as described in U.S. Patent Application No. 10/350,970, filed January 23, 2003, published under U.S. Publication No. US2003/0141655, which is also herein incorporated by

reference. However, other roll centering mechanisms may also be used which have other assemblies for mounting a roll between two members biased towards each other. The spindle members 16 are urged together by a spring coupled to the rack and pinion assembly, as described in the above incorporated patent and patent application, however such spring may be in the pinion gear, such as described in U.S. Patent No. 6,607,316, which is also incorporated by reference. The present invention is directed to the improved spindle members 16, which are coupled to the edge guide arms similar to those shown in the incorporated patent, and a printer and method with such improved spindle members. The portable printer is miniature in that it is of a weight and size suitable for being carried or worn by a user, such as on the belt. Examples of such printers include Models QL220, QL320, and QL420 printers sold by Zebra International, Inc. of Vernon Hills, Illinois. However, the improved spindle members described herein may be incorporated in roll mounting mechanisms in other printers by modification of their edge guide arm or other means for rotational mounting the roll supporting spindle members.

Referring to FIGS. 2 and 3, each spindle member 16 has a circular or disk shaped member (or body) 16a having two sides 23a and 23b. Sides 23a and 23b each have a surface 24a and 24b, respectively, and a centrally disposed conical wall 26a and 26b, respectively, extending from respective surfaces 24a and 24b to edge 27a and 27b, respectively. Walls 26a and 26b provide outer conical surface 28a and 28b, respectively, of decreasing diameter from a maximum diameter at its border with respective surface 24a and 24b. Conical surfaces 28a and 28b are of different maximum diameters to engage roll cores 14a of different diameters, and may have rounded or tapered circular front edge 27a and 27b, respectively. For example, conical surface 28a may be used for mounting 1 and 3/8 inch roll, and conical surface 28b may be used for mounting ¾ inch rolls. The conical surfaces may be of other diameters depending on the desired two roll core diameter sizes to engage the spindle members. A cylindrical shaft 30 having an opening 31 there through extends through disk member 16a and both sides 23a and 23b centrally with respect to conical walls 26a and 26b. The shaft 30 provides a hub for mounting the spindle member 16 on an edge guide arm 18. The front 29a and 29b of respective conical walls 26a and 26b is shown open to show the inside of each conical wall 26a and 26b about the part of shaft 30 extending along respective sides 23a and 23b. However, the front 29a and 29b may be closed about shaft 30, such as by a wall extending from respective edges 27a and 27b, or by providing two post or portions providing the conical surface 28a and 28b, central circular opening 31

extending through such posts or portions rather than shaft 30, where surfaces 24a and 24b represent a ring extending outward radially from the base of such posts or portions. For example, each conical surface 28a and 28b extends about ¼ inch from its respective surface 24a and 24b. The spindle members 16 may be composed of one piece of molded plastic, or of multiple molded plastic parts integrated together.

Each of the edge guide arms 18 has a three (or other number) of prongs 18a along a cylindrical shape to form a shaft 18b upon which to mount one of the spindle members 16. To mount one of the spindle members 16 upon its respective edge guide arm 18, the prongs 18a are received through opening 31 of shaft 30. The conical surfaces 28a and 28b are each truncated at their distal end along front 29a and 29b, respectively, from disk member 16a such that the shaft 30 and its opening 31 is of a length enabling mounting on shaft 18b of each edge guide arm 18. The end of each prong 18a has a latch member 18c providing a ledge extending over the end of the shaft 30 when the spindle member 16 is mounted thereon, thereby retaining the spindle member on shaft 18a and allowing rotation of the spindle member upon shaft 18a. Each spindle member 16 is mounted on its respective edge guide arm 18 such that either side 23a or 23b of the spindle member faces the edge guide arm 18 and the other side will face the roll when loaded in printer compartment 15. For each of spindle members 18, the side 23a or 23b to face a roll is selected such that the maximum diameter of conical surfaces of the selected side will frictionally and releasably engage the inner diameter of the end 14b of a core 14a of a roll 14, such that both spindle members can engage the two opposing ends of roll core and rotate with the roll 14 upon shafts 18b of their respective edge guide arms 18. Diameter of shaft 30 is less than the diameter of shaft 18a such that the spindle member can rotate upon shaft 18a. The edge guide arms 18 may be made of self-lubricating material, such as plastic with Teflon®, to reduce friction when spindle members rotate. To remove each spindle member 16 from its respective edge guide arm 18, the latch members 18c are pushed by a user in an inward radial direction to release latch members 18c from the end of shaft 30 while pulling the spindle member away from the edge guide arm.

In operation, each of the spindle member 16 is attachable to its respective guide member 18 such that the side 23a or 23b of each spindle member 16 facing the roll 14 is selected to have a conical surface 28a or 28b of a diameter for engagement into a core of a roll when loaded in the printer's compartment. The sides of each of the spindle members has a surface 24a or 24b from

which the conical surface of the side extends and the conical surface has a maximum diameter suitable to engage the inner diameter of the end 14b of a roll core 14a mountable upon the conical surface, such that annular region outside the base of the conical surface at surface 24a and 24b contacts side edge 14c of the roll 14 when such spindle member fully engages the roll core 14a. The ability to detach and reverse each spindle member 16 with respect to its respective guide arm 18 thus enables presentation of two different diameter conical surfaces for engaging two different diameter roll core 14a in the printer. For purposes of illustration, FIG. 2 illustrates an example where conical surface 27a of each of the spindle members 16 faces the roll 14, and reversing each of the spindle members 16 would enable conical surface 27b of each of the spindle members to mount onto a roll 14 of a smaller diameter than the roll shown in this figure.

When the crushed roll is mounted it sometimes will not have a core with a circular cross-sectional shape, rather the cross-sectional shape would be oval. The conical surfaces 28a and 28b of each spindle member 16 reshapes the ends of a crushed roll core from a oval cross-sectional to a substantial circularly cross-sectional shape when the spindle members are urged (such as by spring force) towards each other by the centering mechanism into the ends of the roll core. If needed, the user may manually provide additional pressure to push the roll core onto the desired conical surface. This is illustrated by FIG. 4 in which line 32 represents the circular end of the core of a crushed roll prior to locating the roll core on a spindle member 16, and dotted line 33 represents the reshaped or circularized end of the same core after being loaded upon conical surface 28a. Similarly, line 34 represents the circular end of the core of a crushed roll prior to locating of the roll on a spindle member 16, and dotted line 35 represents the reshaped or circularized end of the same core after being loaded upon conical surface 28b.

Although each printer has two identical reversible spindle members 16 for rotationally mounting a roll, a set of multiple different pairs of spindle members 16 may be provided each pair having sides with conical surfaces for different diameter roll cores. Thus, enabling the printer 10 to be adapted for use with more than two roll core diameters as desired.

Preferably, the surfaces extending from sides 23a and 23b of the spindle member are conical to enable reshaping of crushed cores. Less preferably, the sides of each spindle member 16 may have two cylindrical protruding portions, walls, or post, of different diameters to provide an outer cylindrical surface, rather than conical surfaces 28a and 28b, for engaging two different diameter roll cores.

From the foregoing description, it will be apparent that there has been provided a portable printer with improved spindle members for rotationally mounting media rolls of different core diameters. Variations and modifications in the herein described portable printer, spindle members, and method of use, in accordance with the invention will undoubtedly suggest themselves to those skilled in the art. Accordingly, the foregoing description should be taken as illustrative and not in a limiting sense.